

# COST *and* MANAGEMENT

THE OFFICIAL JOURNAL OF THE  
CANADIAN SOCIETY OF COST ACCOUNTANTS

INCORPORATED 1920

HEADQUARTERS, 81 VICTORIA STREET, TORONTO

Telephone Elgin 8914

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Vol. 4

DECEMBER, 1929

No. 12

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## Budgetary Control

By WILLIAM CARSWELL, C.A.,  
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(Before the Kiwanis Club, Montreal, May 16th, 1929.)

**W**HILE the term "budget" as representing the annual estimates which are brought down for the consideration of Parliament is one that is well known in British finance, the applications of the principles of budgetary control to commercial undertakings is only of recent date.

This question of budgetary control has of recent years received considerable attention in the United States and has been the subject of much discussion and consideration in the various cost and management associations of that country.

The very satisfactory results which have been attained by the United States Government in the control of its expenditures by the operation of the national budget has undoubtedly given a great stimulus to the adoption of some system of budgetary control in many of the larger business enterprises of the United States.

I am afraid, however, that very little in this direction has been accomplished in Canada, and as I feel that it is a subject which merits the attention of every business executive in Canada I offer no apology in presenting to you some of its phases.

As the ramifications of the subject are very extensive it must be apparent that to keep within the time allotted to me I can only deal at this time with the broader principles and aspects of the matter, leaving the detail phases to be discussed in future papers.

I will, therefore, proceed to outline the general principles of budgetary control in relation to all the principal activities of an enterprise which apply with equal value to any business, whether manufacturing, trading or merchandising.

We will now proceed to the consideration of budgetary control under the following principal division:

- (1) Advantages to be gained by operating under a budget.
- (2) Preparation of the budget.
- (3) Control.

### Advantages to Be Gained by Operating Under a Budget

Budgetary control gives the following benefits to an enterprise:

- (1) A definite standard and goal, a means of measuring accomplishment.
- (2) The co-ordination of all its activities.
- (3) The administrative control of its expenses.
- (4) The control of investment, merchandise, receivables and additions to plant.
- (5) An estimate of future financial requirements.
- (6) An estimated balance sheet and profit and loss at end of budget period.

## BUDGETARY CONTROL

### 1. *Definite Standard and Goal—*

As the chart and compass is to the mariner so is the budget to the business executive. When compiled with care and foresight (and a budget prepared otherwise is worse than useless) it is a guide and standard by which the activities of the business can be studied from month to month. It has a special advantage, in that it provides a stimulus to the heads of all departments and all down the line of organization to put forth their best efforts, not only to accomplish the programme set for their performance but to exceed it by the greatest possible margin. The realization of the budget which has been set for each department head gives him a definite mark at which to aim and is a definite measure of what the executive expects of him. It gives a department head an opportunity to plan his organization to the best advantage, knowing that to a considerable degree his administration will be judged by the manner in which his responsibility is fulfilled and his budget is met. The executive officer, on the other hand, is relieved of a great deal of detailed supervision and he has some concrete standard which he expects each of his department heads to live up to. In case any one of his department heads does not live up to his budget the fact is brought before the executive before the situation can possibly become serious.

Any great discrepancy between the actual transactions and the estimates must result from one of three causes: estimates may have been carelessly prepared; the department heads may have departed from the programme which they had set; or, unusual outside conditions may have brought about the change.

In any event, these discrepancies should be investigated and explained. They are signals—sometimes danger signals—and must not be ignored. Thus, it can be seen that the budget forms a reasonably accurate forecast of the future conditions to be met by the management. It serves as a general guide, in that it often forestalls mistakes and unwise moves, or, at least, points them out in time to avoid great loss. The budget forms the basis for a revision of plans when changing conditions makes a revision necessary. Unless the management has some guide by which to gauge the concern's progress it will not be able to tell at once when a change in plans is desirable, and losses or misdirected efforts must result.

### 2. *Co-ordination of Activities—*

A system of budgetary control is the best factor that can be devised to bring about the co-ordination of a business to the fullest degree. It is impossible to draw up a budget that is worthy of the name without holding many conferences on the subject, and all departments must work toward the one end. Without such control it is quite possible that one department will work more or less at a tangent and the results that would be obtained would naturally be more or less unbalanced. Under budgetary control, for example, the manufacturing department is enabled to plan for the output required by the estimated sales in such a way as to result in the greatest possible economy. In this way standard lines of output can be run through in economical quantities instead of in smaller lots, and, consequently, costs can be kept on a uniformly low basis. On the other hand, the estimates of sales may require the production for the budget

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period to be curtailed so that large inventories may not be piled up in excess of the normal requirements of the business. The manufacturing department is also enabled to plan its organization and activities sufficiently far in advance to permit it to carry forward its operations with a minimum of disturbance and confusion. From the estimate of sales it can also arrange for quantities of raw materials to be ordered for delivery at the proper periods for the required production.

The financial department can plan the expenditure and receipts just as carefully as the sales department plans sales or the manufacturing department plans production. By this means it is possible to prepare for financial requirements in advance of the actual need. This makes it necessary that the appropriations of the budget be closely followed. The treasurer would be in constant trouble if department heads were permitted to spend money without conforming to the standard which had previously been set for them.

### 3. *The Control of Expenses—*

Preparation of a budget makes it practicable for the expenses of each department for the budget period to be determined on a basis commensurate with the volume of sales and production anticipated. The expense budgets of each department should, of course, be drawn up, having regard, first of all, to the functions of the specific department and the estimated volume of business to be done during the budget period. The expense budget, when finally approved, may be considered as a definite authorization to the department head to make the expenditures covered by his budget, and enables him to plan the organization and operation of his department for the budget period to the greatest possible advantage.

### 4. *Control of Investment—*

#### *(a) Proper Control and Planning for Productive Capacity:*

The anticipated volume of sales will, of course, have to be considered by the manufacturing department in the first instance from the point of view of productive capacity. If the estimated sales demand production in excess of the capacity either of the plant or space it immediately becomes necessary to consider whether under existing business conditions, or the conditions peculiar to the specific business, it is advisable to make the necessary extensions and expenditures to provide for the increased output.

#### *(b) Merchandise Investment:*

From the estimated sales and relative output of product required the investment in raw materials, process goods and finished stock, required from month to month, can easily be ascertained from the predetermined standards which, I assume, have been set for such investment. The principle applies equally in the case of a manufacturing and merchandising business, or in a merchandising business only. I know of no feature of budgetary control which is more necessary to profitable operation. Many of us can recall—some I fear with very unpleasant recollections—the enormous inventories at high prices which had been accumulated in 1920 during the period of intense business activity, and which had subsequently to be sacrificed at reduced prices, with resulting loss when the depression of 1921 set

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in. There were, of course, many contributory causes, but I do feel that under a proper system of budgetary control such losses could have been greatly minimized.

Standards for raw material investment should be a certain number of days' stock, depending on a length of the manufacturing operation, the distance from source of supply; while finished goods should, of course, represent a definite number of days' stock sales, depending on the conditions surrounding the business for which the standards are being set. In some cases 30 days would be excessive, while in others 90 days' stock, or even more, might be required. It is essential to have a carefully thought-out measurement and then adhere to it as closely as is practical. This question has, of course, direct relation to that of turnover, which is the secret of success in any merchandising business.

### (c) *Receivables:*

Standards for a given number of days' receivable allowable are also required to give a measure of the efficiency of the collection of accounts receivable.

### 5. *Provision for Financial Requirements—*

The preparation of the sales and manufacturing expenses and capital expenditure budget give, of course, the accountant's department the necessary information upon which to base the estimated receipts and payments of the business so that he might be in a position to advise the management as to whether the estimated business can be handled without increase of capital, having regard to the banking and other credit facilities of the company.

### 6. *Estimated Profit and Loss Account and Balance Sheet—*

The division of the budget into the revenues and expenditures of the business permits of an estimated statement of profit and loss account for the period under consideration, and a balance sheet for the end of that period being prepared. Such statements are, of course, of considerable use to the management in laying the plans for the operation of the business during the budget period.

The value and use which can be made of these estimates is evident when we realize that the success of a business enterprise is dependent chiefly upon the ability of the management to plan intelligently for the future, and that a large percentage of business failures is directly traceable to neglect in anticipating financial needs in time to provide for them. Construction work, provision for the expansion of business, increased sales, rising costs of production, etc., must be anticipated and provided for before they actually arise. The diversification of industry and the constantly increasing necessity of depending upon indirect supervision and management, together with rapidly changing business conditions, necessitate the use of scientifically prepared forecasts.

## Preparation of the Budget

### (a) *Length of the Budget Period:*

The length of the budget period naturally depends on the type of business for which the budget is being prepared. Where the nature

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of the business requires an extended period of manufacture from the purchase of raw material until completion of the final product it is essential to plan ahead for a considerable period. For example, in the case of all businesses which utilize the products of the forest, where it may take one, two or even three years for the logs to be driven from the point of cut to the mills, it is necessary to formulate plans for an extended period.

It will, however, be found that the most practical period for ordinary budget statements is that of the fiscal year of the company concerned. In many cases it is considered advisable to adjust the budget for varying conditions which happen throughout the year.

### *(b) Responsibility of Budget Preparation:*

The figures required for the budgets covering the various activities of departments should be prepared by the department head responsible for the operation of the section to which these figures apply. Such department head, being naturally closest to the conditions and having a direct personal interest in the performance, is unquestionably more fitted to establish the correct figures than anyone not quite so close to the field of activity. The figures submitted by each department should be supervised by the general head of that department.

The control of all budget operations should clear either through a budget committee or the chief accounting officer of the company, who will see that the figures of each department's budget properly correlate with those of the other departments.

### *(c) Approval:*

The approval of the budgets when finally checked by the accounting department should be given by the president and, where the company regulations require, by the board of directors.

### *(d) Sales Budget:*

The first step towards the preparation of the general budget must necessarily be to obtain the sales estimate for the budget period from the sales department. The difficulties attendant on the preparation of this budget are covered, of course, by the type of product manufactured, the question of fluctuating markets, multiplicity and question of standardization of products and the seasonal fluctuations which apply to the particular type of business.

The first step towards the preparation of the sales budget is to have each salesman survey the possibilities in his territory and prepare an estimate of the sales which he computes can be obtained from it during the ensuing budget period. These preliminary estimates should be gone over by the department head in the office to whom the salesman reports and any corrections and amendments which he considers necessary should be made. The estimated sales of "key" items will be found to be a valuable aid in the preparation of the general sales budget. Such items frequently point out where sales efforts may be directed to produce greater results. Let us take for the sake of better illustration a manufacturing plant with distributing houses situated throughout Canada. After the salesman's budgets have received preliminary examination and approval they should be gone over by the district manager and, when passed by him, summarized under

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the various classifications of sales which are maintained by the business, thus obtaining the total estimate of the sales under each classification for that particular house for the budget period. Budgets for all distributing houses, when forwarded to the head office, should be finally scrutinized by the general sales manager, after consultation with the subordinates in the head office who are responsible for the distribution of the various classes of products, and a final summary of the whole company prepared.

When the sales budget has been finally determined upon, it forms the basis for the estimate of the manufacturing department's budget for the ensuing year. The sales budget should, therefore, be forwarded to the accounting department, where the estimated rates of gross profits should be applied and the estimated output of the factory obtained.

### (e) *Manufacturing Department Budget:*

The figures of estimated output required as submitted by the accounting department to the manufacturing department are reviewed by the manufacturing department to ascertain:

- (1) If the required budget can be manufactured during the budget period with the plant and equipment then existing.
- (2) If the quantity required by the budget cannot be produced with the plant and equipment then available, it will be necessary to confer with the sales department to find out whether or not the plant should be increased. In case the sales department think that from their point of view there is sufficient cause for an increase in plant, an estimate of the cost of such increase must be prepared and forwarded through the regular channels for the necessary approval.
- (3) If the necessary raw material can be obtained to provide for the manufacture of the required output within the budget period.

As soon as the manufacturing department has determined that the budget submitted by the sales department can be carried out by them it becomes necessary for them to translate the general budget into schedule of manufacturing output which will enable the manufacturing department to deliver for distribution the quantities of the various products at the intervals required by the sales department. Due regard must, of course, be had to the necessity of maintaining minimum stocks which have to be maintained to give the necessary service for customers' requirements.

The manufacturing department will be enabled to place its orders in such quantities as to permit of the most economical manufacture possible, and from this point of view it may be necessary in certain cases to create temporary overstock of certain products rather than manufacture small lots at excessive costs.

This factor of quantity production is, of course, of weighty consideration where the cost of output includes heavy setting-up charges or adjustment of machinery, such as in the case of special cables or in the case of the various sizes of rolled steel products.

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The principle of budgetary control should be carried where at all practicable into the control of the materials required for each particular class of output. Where standard practice does not exist, as for example in steel mills, past experience will be a very ready guide as to the quantity of raw material which should be required for each class of output. When this standard has been determined upon, the orders to manufacture, giving quantities of output, should be the authorization to draw material for that output, according to the standards which have been set. No excess of raw materials should be issued by the stores department for such orders except on the approval of some responsible head in the manufacturing department.

It seems hardly necessary to state that budget or standard rates for the apportionment of manufacturing expense should be used, as any other method is manifestly inefficient in the majority of cases.

Where piece work rates exist the standard of labor is very easily compiled, but where ordinary day labor is used it will be necessary to provide standards from past experience.

### *(f) The Manufacturing Department Expense:*

The departmental expense of the manufacturing department should also be budgeted so that the superintendent may have a guide by which to judge the cost of administration of the various departments by respective performances.

It is, of course, apparent that the expenses of the manufacturing department are not directly proportional to the output, as, of course, fixed charges in the nature of rent, general supervision, depreciation, etc., have to be met, irrespective of the volume of output.

Variable charges have, of course, direct relationship to the volume of production, so that it is a comparatively easy matter, from past experience, to draw up percentages of expense to output of the various departments which would apply according to the percentage that the output bears to capacity.

### *(g) Distributing and Administrative Expense:*

As one of the principal advantages of preparing budgets of administrative and distributing expense is the control of such expenses it is very necessary that proper classifications of accounts be maintained, to permit of various expenses of the company being properly allocated so that the various department heads can properly prepare the expense budgets and account for the expenditures of the various activities for which they are responsible.

Detailed analysis of expenses under the various departments and classification of expense are, of course, maintained, so that proper monthly reports can be prepared. After the final determination of the sales and manufacturing department's budget, each department prepares his estimated expenses for the ensuing year, having regard to the volume of output and the estimated sales to be made, basing, of course, such estimate of expense upon the increasing or decreasing demands which will be made upon the department by reason of the manufacturing and sales programme for the ensuing year. These budgets should be prepared showing the expenses for the previous year and their relationship to sales so that the budget committee and management may have some guide as to the propriety of the expenses

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submitted in relation to the previous year's performance. The expense budget, when prepared, will, of course, be summarized by the accounting department and the relation to sales of each department's expense worked out and compared with previous years' results and standards, and submitted to the management for its consideration.

When the sales, manufacturing and expense budgets have finally been checked up by the accounting department it is then possible to prepare an estimated statement of profit and loss for the year, based upon the budget figures submitted, and from the budget estimates of the number of days' merchandise and receivables which would be set up it is possible to prepare an estimated balance sheet at the end of the fiscal period, after taking into account, of course, any requirements for additional plant sinking fund, dividend payments, etc. From this estimated balance sheet can be approximately ascertained what the general financial position of the company will be throughout the year, making due allowance for periods of peak production and merchandise investment caused by seasonal and other factors, so that the general financial programme of the company can be determined upon.

The complete budget statements, when thus prepared, should be submitted to the management, with explanatory statements where necessary, for the consideration and final approval.

In connection with the sales department expenses it should, of course, be remembered that only in very few cases it is not possible to increase the volume of sales by additional expense, so that the estimated sales department expense will be a factor in deciding the management as to whether it is advisable to obtain an additional volume of sales as the expense required.

After a careful study of the expenditures required to produce the sales budget and the corresponding expenses of the various departments the management will then finally approve or amend the budget. When the budget has been thus approved, it represents a direct authorization to the head of each department to organize his department in keeping with the budget, as the approval of his budget is his authority to expend up to the limit set by his budget figures.

### Financial Forecast

Two problems present themselves in connection with financial budgetary control:

- (1) The broad viewpoint or general financing required for the budget period.
- (2) The ordinary month to month or day to day financing.

The estimated balance sheet prepared as at the end of the budget period in the manner outlined above will give, after taking into consideration the peak investments in merchandise and receivables, the amount of additional capital to be provided, if any. After due consideration as to the future possibilities and plans of the company the method of providing the necessary money, either by additional stock, bonds or through banking and credit facilities, will be decided upon. In this way the management will have provided for their general financial arrangements for the ensuing year.

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In order that the treasurer may be in a position to economically arrange for his financing from month to month, a monthly forecast of receipts and expenditures should be prepared giving the estimates of expenditures under the various main classifications of expenditure, such as purchases, wages, freight and duty, plant, etc. These are submitted by the various departments responsible to the accounting department, who check them over and prepare the necessary statement for submission to the treasurer's department not later than the 10th of the month. At the end of the month this financial forecast is checked up with the actual performance to see what errors were made in the original forecast, so that they may be avoided in future statements.

In some cases the financial budget may be prepared to show the receipts and expenditures under the various classifications by months.

### **Control of the Budget**

(a) When once the budget has been prepared and approved, provision must be made so that the executive may at all times throughout the budget period be in a position to know exactly how the actual results compare with the budget. The reports should be in sufficient detail to present a true picture but should avoid unnecessary detail or their true purpose may easily be defected. The usual monthly reports of the company's activities, such as sales, expenses of each department, expenses of manufacturing operations, etc., should all be prepared so as to show in comparative columns the actual expenses for the month and the period of date, together with the corresponding figures called for by the budget. In some cases it may be advisable to use percentages of realization of the budget rather than to show the actual detail figures. The following may be used as illustrating a few types of reports:

### **The Sales Factor**

(b) In cases where the demand for the company's products have wide seasonal fluctuations it is essential that due allowance for this factor be made when dividing the annual sales budget into months for comparative or checking purposes. This factor can be obtained by a study of the sales by months of the preceding few years. When these factor figures are applied to the sales budget the result will be the expected sales by months during the term of the budget.

It may be found advisable to prepare expense statements on a similar basis, although it is generally found more convenient and satisfactory to divide the expense budget by 12 to arrive at the monthly quota. It should be certainly understood that under no circumstances is a head of a department to be permitted to exceed his budget expenditures without proper approval by the budget committee, or, if the regulations so provide, by the general manager or president. Many of the advantages of budgetary control are lost if this is not insisted upon.

A copy of the statements affecting the activities of each department should be sent to the head of that department monthly, attention being drawn to any variations worthy of comment.

The foregoing statements lead to one of the most important points in regard to control of any business by budget, and that is the func-

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tion performed by the accounting department. In order to prepare a budget an efficient and close-working accounting system is invaluable, but in carrying out the budget the accounting department plays an even more important part. The accuracy of the budget will depend in a great measure upon the accuracy with which past transactions can be interpreted; this means that accurate cost records must be available. The final results of the budget are presented to the executive through the reports from accounting department and, consequently, the accounting department should perform the main function in the preparation of the budget—i.e., it should assist the department heads with reports of past performances and statistical information, if such is kept available.

A successful budget presupposes an efficient accounting department. All transactions come under the scrutiny of this department, and here all expense items are classified and all sales placed in their respective sales class. Unless this work is done in such a manner that all department heads have confidence that it is done properly certain difficulties are certain to arise, particularly with those department heads whose realization does not come within the budget.

A budget should not be adhered to slavishly or without intelligence. It is forecast and a chaff for the guidance of the executive and his staff. One of its chief advantages lies in the fact that it gives its own signal when it ought to be revised to meet changing conditions. Then the budget itself forms the basis for the revision. Usually the first indication of the necessity for budget revision comes from the sales department, which is the most sensitive part of the organization and the first to feel a change in business conditions. A definite change in the sales budget once assured is a signal for a change in the other portions of the budget. The business is thus enabled to keep in a reasonable balanced condition throughout changing trade conditions.

### Conclusion

The above is a general outline of how a business may be controlled under a budget system. No attempt has been made to give more than a general outline of the system. It is not contended that a system of budgetary control will take the place of those qualities on which all successful business is built, viz.: foresight, judgment, and executive ability. However, it does assist greatly in relieving the executive of the weight of detail, and it is one of the best means that I know of to develop junior executives. The benefits of budgetary control may be again briefly summarized as follows:

- (1) Budgetary control provides a definite plan and standard.
- (2) Provides for co-ordination of the activities of each department.
- (3) Control of expenditures.

To these we might add the training and development of the department heads. This training is bound to follow the increased responsibility which they assume under the system.

There is no more useful instrument in the hands of capable and efficient management which can more assist that management in carrying out its functions and in planning for and measuring the results to be desired.

## The Development of Gas Manufacture and the Uses of Gas

By HUGH McNAIR,

*Manager, Gas Utility, Winnipeg Electric Company.*

(Before Winnipeg Chapter, October 21, 1929.)

LONG before "manufactured gas" was discovered natural gas was known to the early Greeks, who thought it was the breath of a god and commercialized is the breath of Delphi. The Chinese also used natural gas centuries ago and distributed it through bamboo pipes.

It was in 1609 that John Baptist Van Helmot, of Brussels, when working in his laboratory, made what to him was a startling discovery. He found that a crucible containing soft coal, when heated, "did belch forth a wild spirit or breath." He called this spirit "geest," which in Dutch means gas. In this manner manufactured gas was discovered and named. We of to-day, a generation of people quick to realize the commercial importance and possibilities of a new discovery, naturally would think that the engineers of Van Helmot's time would immediately have investigated the source and possible use of this spirit.

History fails to reveal such an investigation, for no mention is made of gas until 1670, when it is recorded that Dr. Clayton, a rector of Yorkshire, England, like Van Helmot, made gas. He, however, collected the gas in bladders and amused his friends by pricking holes in the bladders and lighting the gas with a candle.

### First Commercial Uses

It was in 1792, 200 years after gas was discovered, that William Murdoch, a Scotchman from Ayrshire, made the first practical application of the use of gas. He discovered that gas obtained by the distillation of coal burned with great brilliancy, and it occurred to him that by confining the gas and conducting it through tubes it might be employed as an economical substitute for lamps and candles. Using some seventy feet of tinned iron and copper tubes, he conducted the gas to his house at Redruth, Cornwall, and succeeded in lighting it to his satisfaction. In 1798 he had progressed so far that he moved from Cornwall to the works of Bolton Watt & Co., manufacturers of steam engines at the Soho foundry, where he built an apparatus on a large scale and lighted the factory with gas. Murdoch thus made one of the first steps towards obtaining the comforts of civilization. On the occasion of the celebration of the Peace of Amiens, the signing of a treaty between Great Britain and France, Spain, and Holland, in April, 1802, a public display of new light was made which attracted wide attention and comment. Matthews, one of the earliest writers on gas lighting, in describing this spectacle, says:

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"The illumination of Soho works on this occasion was one of extraordinary splendour. The whole front of the extensive range of buildings was ornamented with a great variety of devices that admirably displayed many of the varied forms of which gas light is susceptible. This luminous spectacle was as novel as it was astonishing, and Birmingham poured forth its numerous population to gaze at and to admire this wonderful display of the combined effects of science and art."

In 1804 Murdoch built a gas works and lighted the cotton mill of Messrs. Phillips and Lea at Manchester with 900 burners. It is related that on one occasion Murdoch desired to stop the flow of gas which was burning from an open tube and to accomplish this purpose he picked up a thimble and clapped it over the flaming end of the tube. The thimble had been pierced in many places and the gas, coming through the holes in smaller volume, was brought into contact with a greater proportion of air at the point of combustion. The result was a much better light. This incident was the origin of the "gas tip" which later came into general use.

While Murdoch was carrying on his demonstrations others were actively engaged in the effort to harness the "spirit of coal." In 1784 Jean Pierre Minckelus lighted gas distilled from coal as a demonstration to his class in the University of Louvain, and just three years previously Lavoisire invented a gas holder which was used instead of bladders, the common receptacle for storing gas among the early adventurers in "gas manufacture." Lebon, in 1799, obtained a patent in France for making gas by distilling coal or wood, and in 1801 lighted his home and gardens in the Rue St. Dominic, Paris.

### World's First Gas Company

About this time Albert Winsor, a German who seemed to have been more of a promoter than a scientific research worker, played an important part in forming the first gas company in the world. Winsor claimed that gas could be used for heating as well as lighting and would result in a three-quarter saving in the construction of buildings because of the elimination of chimneys, stoves and other equipment used in burning other fuels. "Nay," he remarked in one of his pamphlets, "it will almost appear incredible to assert that the same table, desk or sideboard which furnished a light or flame will serve to warm any room and even dress my victuals in case of need, and by the mere turning of a cock or the corking or uncorking of a small pipe or tube." On May 18th, 1804, Winsor obtained the first British patent for gas making purposes. Winsor continued his attempts to form a gas company and on January 28th, 1807, the first public street lighting with gas took place, when the Pall Mall was illuminated with gas. In April, 1812, Parliament granted a charter to Winsor's company, "The London and Westminster Gas Light and Coke Company," and thus the first gas company in the world came into being, and on December 31st, 1813, Westminster Bridge was lighted with gas, dumbfounding the populace of London. Napoleon called the lighting of London with gas one "grand folly," and Sir Walter Scott, writing to a friend, said: "There is a madman proposing to light London with—what do you think?—why, with smoke!"

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### Beginnings in United States

The first recorded demonstration of gas in the United States was in Philadelphia, in August, 1796, according to Watson's "Annals of Philadelphia," which relates that gas was manufactured by Mr. Ambrose and Company, Italian fireworkers and artists. The first practical use was made in 1812 by David Melville, a resident of Newport, R.I., who lighted his home and street in front of it with coal gas. He also lighted a factory at Pawtucket and induced the Government to use gas at the Beaver Tail Lighthouse. In 1816 the first gas company in the United States was organized in Baltimore, Maryland, and in spite of remonstrances by prominent citizens, the second was organized in Boston in 1822. A storm of protest was aroused in New England, for it was claimed that the lighting of the streets with gas would: (1) interfere with the Divine plan of the world, which had preordained that the world should be dark during the night; (2) that it would incline people to remain out of doors and thus lead to increased ailments by colds, etc.; (3) that it would dispel the fear of darkness and encourage drunkenness and depravity; (4) that it would rob the festive seasons of their charms. In the United States gas was used at first for street lighting; later public buildings were lighted in this way, and a few wealthy citizens lighted their homes with gas. It was not until the years 1865 and 1875 that the use of gas lighting began to make any great progress on the American Continent.

### Domestic Uses

The first authentic recorded use of gas for domestic purposes was about 1830 or 1832, when James Sharp, of Northampton, England, demonstrated the availability of gas for cooking in his own home. It was about the year 1859 when gas started to be used to any extent for cooking in the United States, and this was done chiefly on stoves imported from England.

Much interest was manifested at an exhibit of different types of gas stoves shown at the Centennial Exhibition, held in 1876, in Philadelphia. Many of the exhibitors used gas stoves in connection with their exhibits, notably a baking powder company which demonstrated the baking of cake on gas stoves.

For some years, due to the high price of gas and to the cost of the appliances, the use of gas cooking devices for domestic purposes was retarded. Since about 1895, however, as the price of gas has been greatly reduced and the cost of fuel appliances has been made within the reach of every one, their use has become general. The public now thinks of kitchens in terms of gas ranges, substantiated by the fact that there are 1,000,000 gas cooking stoves sold yearly in the United States alone.

### Now an Essential Service

Gas has become so important for industrial purposes that the city, town, village or municipality which cannot offer a good gas service will find that important industries will pass them by and locate where a good gas supply can be obtained at a reasonable rate. Gas is used at the present time for baking bread in large and small bakeries, making candy, roasting coffee, smoking meat, pasteurizing milk, pressing clothes, singeing cloth, making glass goods of all kinds,

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and melting different kinds of metals, vulcanizing auto tires, drying clothes, drying lumber, ripening fruit, forging, heating rivets, galvanizing, welding, cutting metal, annealing, hardening and tempering alloy steel, tool dressing, bolt and rivet making, welding locomotive tubes, heating structural steel for fabrication, flanging and banding pipes, plate heating, soft metal melting, aluminum refining, lead refining, silver refining, baking enamels, heating enamel ovens and for many other industrial purposes. Gas has also recently come into use in refrigeration and ice-making machines. Just recently a large glass factory has been established in Winnipeg and they alone use approximately one million cubic feet per day.

In the early days of gas lighting it was found that gas had a very offensive smell, due to the presence of sulphur in the gas. This sulphur was afterwards found to be present in the form of sulphuretted hydrogen. It was found that by passing the gas through lime that the lime became discoloured but that the offensive odor had gone from the gas when burned. The purification of gas by means of lime became thereafter the universal practice for years.

### Coke an Important Product

It is generally recognized there is a constantly decreasing supply of anthracite coal, and the question of supplying a fuel to take the place of anthracite is one which has created considerable discussion throughout Canada and the United States. A fuel which, by its physical and chemical characteristics is best adapted to replace anthracite is coke, a by-product of coal gas manufacture. Therefore, in choosing a coal gas plant for Winnipeg we were actuated not only by the necessity of furnishing Winnipeg with its necessary gas requirements but also to furnish it with a satisfactory fuel to use instead of anthracite.

There is no question but that coke is in every way as suitable for domestic use as anthracite—in fact, compared to the anthracite being furnished to-day, coke is much superior fuel, and it is interesting to note in this connection that in the United States many of the large Eastern cities rely to a great extent on coke for domestic heating, and this movement is growing rapidly.

### Other By-Products

Coke, tar and ammonia are the principal by-products from coal gas manufacture. The coke produced in Winnipeg is made from a mixture of low and high volatile coal and compares favorably with the best cokes made in the United States. In fact, the mixture and methods of coking are similar to some of the best cokes produced on the American Continent.

In the early days of the gas industry all of the by-products, with the exception of the coke, was more of a nuisance than anything else. The tar had to be burned to get rid of it and the ammonia was thrown on any waste lands near the plant. At the present time use is made of all of the by-products. The ammonia is now recovered in most plants and converted into sulphate of ammonia, nitrate of ammonia, anhydrous ammonia and liquid ammonia. These are used as fertilizers and for industrial and domestic purposes. It is not generally known that the modern photographic industry is dependent

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largely on coal tar chemicals for its success. Then perfumes and flavouring extracts are now largely dependent on coal tar products. There are two classes of these products, one in which the perfume substance has actually been made from tar products, the other in which the substance has an odor similar to the natural one but different in chemical composition. Among the prominent synthetic odors are vanilian, coumarin, musk, heliotrope, bitter almonds, violets and wintergreen, and essence of orange blossom. The safest and most powerful explosives are now obtained from tar products. We have tri-nitro phenol or melinite, tri-nitro toluene or trotol, tri-nitro cresol or erasite, and di-nitro naphthalene, the base of Favier explosive powders. There are also about 900 coal tar dyes on the world's markets, while the number of these obtainable run into thousands. Among the most important dyes obtainable are azo, anthraquinone, azin, sulphide, tri and di-penylmenthene, xanthone, oxazine and thiazin, indigo, syrazolene, stilbene, thiobengynl, acridin, chinolin, nitro and nitross dyes, malachite green, fast black, fusion red, mauve, blue, yellow, orange. In addition, a large number of medicinal substances, poisons, etc., asperin, saccharin, prussic acid, and carbolic.

Professor Perkins long ago showed that in the course of the distilling 100 pounds of coal to get the  $\frac{1}{4}$  ounce of mauve dye it could originate there was produced  $2\frac{3}{4}$  ounces of benzol. Now toluol, the essential factor of the famous explosive T.N.T., is only obtainable from distillation in about the proportion of  $\frac{1}{4}$  to  $\frac{1}{5}$  of benzol. The startling fact becomes evident that the manufacture of the beautiful mauves and indigos of commerce which help by their wide use to decorate and beautify the world are intimately interchangeable into the most deadly explosives known to man (a Jekyll and Hyde phase of chemistry). Benzol, toluol, carbolic acid, picric, sulphuric and nitric acids are the chemicals from which, in further process of manufacture, dyes and high explosives are alike made.

### Water Gas and Coal Gas

It might be well here to consider anew of the basic facts involved in the manufacture of artificial gas for domestic purposes. There are two generally accepted methods of large scale productions of artificial gas. One of these is the water gas method where, by passing steam through a hot bed of fuel and enriching the gas thus made with oil there is produced a very satisfactory gas for domestic use. This is a very simple method of gas manufacture and is quite extensively used throughout Canada and the United States. It has certain disadvantages, however, which have prevented us from adopting this method as our source of supply, the principal one being the high cost of oil for enriching.

The other method of gas manufacture is the coal gas method which has been adopted by the Winnipeg Electric Company, and in this address I will describe the plant now in use for the production of coal gas. Before doing so, however, it would be as well to touch briefly on a few of the advantages which will result from building a plant of this type.

In addition to the gas and coke produced in the plant which is in operation there is also recovered from the coal quantities of tar and

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ammonia. There is set out below a table showing the different quantities of these materials which are recovered in carbonizing each ton of coal:

Gas .....	10,000 cu. ft. per ton
Coke .....	1,400 pounds per ton
Ammonia (NH <sub>3</sub> ) .....	5-6 pounds per ton
Tar .....	10 gallons per ton

These figures are relative only and are largely governed by the quality of coal used. They represent, however, a fair average of the yields which may be expected when using a good grade of gas coal.

### Manufacture of Coal Gas

There are several different methods of coal gas manufacture, all of which are based on the same principle but which, by virtue of different plant design and different application of the basic principle involved, give a wide range of results. The method chosen by the Winnipeg Electric Company was the by-product coke and gas oven method, whereby coal is carbonized in hermetically sealed chambers, approximately 23 feet long, 10 feet high, with an average width of 13½ inches. These chambers or ovens are arranged paralleling each other in what is known as a block or battery of ovens, each chamber being separated from the other by another chamber in which the gases for carrying on the coking process are burned. These combustion chambers are divided into 16 individual vertical flues, having individual gas and air inlets at the bottom, and are connected at the top to a horizontal flue; this is, in turn, connected with the horizontal flue in the adjoining heating chamber by means of a crossover valve which passes over the top of the adjoining oven. Underneath the ovens and heating chambers, and running parallel to the same for the entire length of the battery, are located regenerators which are approximately 24 feet long, 12 inches wide and 8 feet 8 inches high. There are two regenerators for each oven and each regenerator is separated by a 9-inch brick wall. These regenerators are filled with 9-inch clay check brick, which serve to recover heat from the waste gases passing from the heating chambers on their way to the stack, transferring this heat to the incoming air and gas used for combustion.

The ovens are designed so that they can be heated with either coal gas recovered in the coking process or with blue water gas or producer gas. To furnish the necessary heat required for coking requires the use of approximately 35 per cent. of the total gas produced, and as this is a rich gas, containing approximately 590 B.T.U's per cubic foot, it is thought advisable to build a producer plant in connection with this installation whereby producer gas could be made and used for heating the ovens, releasing all of the coal gas made for distribution. It should be explained that producer gas contains only from 130 to 140 B.T.U's per cubic foot and is, therefore, a more practicable fuel to use. Producer gas is made by introducing air and low-pressure steam through a hot bed of coke, and, while this gas is perfectly suitable for heating the ovens, it does not have sufficient heating value to permit its being used for domestic purposes. Coke breeze and the smaller sized coke, which does not have a ready market and which is not particularly desirable for domestic purposes, are used in the producer.

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It is interesting to note here just how combustion takes place in the heating chambers. As stated above, each chamber is served by two regenerators. Producer gas, after being cooled and cleaned, is introduced into one of these regenerators and air into the other. The gas and air passing up through the highly heated checker work in the regenerators, meet at the bottom of each vertical flue and combustion takes place at that point. The flame extends upwards through each vertical flue and the products of combustion pass into the horizontal flue and are drawn through the crossover flue into the opposite horizontal flue; passing down through the vertical flues of the adjoining heating chamber and regenerators, and from there through the stack into the atmosphere. As stated before, the regenerators recover a very large percentage of the heat contained in the waste gases. At half-hour intervals this process is reversed and the flues which had served for the outgoing gases now serve as the flame flues and vice versa. In this way a constant heat balance is maintained in the various heating chambers and regenerators. The heat generated in the combustion flues penetrates through the brick work separating the flues from the oven chamber and drives off the volatile or gaseous matter in the coal. It should be stated here that the ovens are airtight, the doors at each end and the openings at the top of each oven for receiving the coal charge being sealed to prevent admittance of air during the coking period. When operating at capacity, the coking period consumes approximately 12 hours, although this can be increased, if desired, by simply reducing the amount of gas admitted to the combustion flues. This, of course, serves to reduce the gas output of the plant and is done to adjust the output to the demand.

Another way of reducing the gas output is to shut down the producer plant and use oven gas for heating the ovens. These factors are, of course, very important and make the plant a very flexible one.

During the coking process the gas from the coal is drawn off from the top of the ovens, passing through an ascension pipe located at the top of each oven. This pipe is connected with the collecting main, which runs along the top of the entire battery.

The collecting main is connected to a crossover main which carries gas to the by-product room, where the tar and ammonia are recovered from the gas. It is then purified and is ready for distribution through the city mains.

### Processes

In order to follow the process of manufacture from its inception we must begin with the receipt of coal in cars at the plant. From the cars it is dumped into a track hopper and is carried from the track hopper by means of conveyors to a crusher, where it is crushed to  $\frac{1}{2}$  in. and under. From the crusher the coal is taken to the coal bin, located at the top of the oven battery, by means of a chain and bucket elevator, which also serves to handle the coke used in the producer. The coal bin has a capacity of 250 net tons of crushed coal. The coal is taken from the storage bin by an electric lorry car and is charged into the ovens through charging holes which are located in the top of each oven. This electrically-operated car runs on a track which is laid on top of the ovens. Scales record the weight of each charge of coal as it is loaded into the lorry car from the overhead coal bin. Each oven has a capacity for holding 6.8 tons net of coal. At the

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expiration of the coking period the doors are removed from each end of the ovens by means of electrically-operated door machines and the oven is then ready to be pushed. This is done by a pusher machine electrically-operated forcing a ram through the oven. The coke falls into an electric quenching car running on rails paralleling the battery. This car carries the hot coke to a quenching station located at the end of the battery, where a large quantity of water is discharged on the coke from an overhead tank. The quenching car has a slanting bottom and one side is arranged with gates, which are opened after the coke is quenched, and permit the coke to slide onto a wharf, where it is allowed to cool further and where any hot spots are quenched by means of a hose. From this wharf the coke drops through gates to a conveyor paralleling the wharf, which carries the coke to the crushing and screening station, where it is crushed and screened into proper size for the various uses to which it is put.

This plant was designed and built by the Koppers Company, of Pittsburgh, U.S.A., which company is the largest in the world engaged in designing and building by-product coke and gas ovens. The plant is equipped with labor-saving devices wherever possible, and is one of the most modern coal gas plants in the world.

The battery consists of 17 ovens commonly called Koppers patented cross regenerative, combination ovens. Each oven chamber has an average width of  $13\frac{1}{2}$  in. with a  $\frac{3}{4}$  in. taper and is 10 ft. 10 in. high, 23 ft.  $8\frac{1}{2}$  in. long from the face to face of doors, and are 3 ft.  $6\frac{1}{4}$  in. centre to centre.

The oven walls are rectangular construction, with 16 vertical flues. Over every other chamber a cross flue is provided connected the horizontal flues on either side of the oven chamber. There are two regenerators per oven; each regenerator chamber is 24 ft.  $9\frac{1}{2}$  in. long inside of the ends of the walls, 11 ft.  $\frac{7}{8}$  in. wide and 8 ft.  $8\frac{1}{8}$  in. from the bottom of the checker brick to the top of the chamber, with  $9\frac{1}{4}$  in. wall between each regenerator. Each chamber had individual connections to the air boxes through rectangular openings in the base of the regenerators. Each regenerator chamber is filled with checkers consisting of 9 in. clay straights and blocks.

Provision is made for steam connections to each oven so that later, by adding steam piping, blue gas can be made for a period before pushing the oven. The oven brick work exposed to high temperatures is of silica laid in silica cement. The secondary portion is of fire brick laid in fire clay. The regenerator face is of common red brick; the fill above the oven is common red brick laid in fire clay. The top of the ovens are paved with second quality paving brick. Insulating brick is used to insulate the ends of the regenerators and the oven doors. The battery pinion walls are of red brick. The coal bin is of structural steel and has a capacity of 250 tons. The bin is built in one bay, 20 ft. x 28 in. wide, with two hoppers; each hopper is equipped with a hand-operated 20 ft. square gate. A head house is provided for housing the head end of the elevator. The bin is designed so as to permit the installation of the producer in that portion beneath the larry floor and to support a bin for producer fuel. A larry truck is provided on the top of the ovens, extending the entire length of the battery. The rails are 85 per and are bolted to one cross tie rod at every other oven steel track bumpers, with wood bumping blocks are provided at the ends of the track.

## Municipal Accounting

By D. R. PATTON, C.A.,  
*Secretary, Montreal Chapter.*

A FEW members of the "Cost Accountants" took advantage of the invitation tendered to them by the General Accountants Association in Montreal to hear James Wishart, Secretary-Treasurer of the City of Verdun, discuss "Municipal Accounting" at their meeting of October 30th. Mr. Wishart certainly was well worth hearing, and gave a clear and concise presentation of the essentials of accounting procedure for a municipality. Mr. Wishart stated that the Province of Quebec divides Municipalities into four categories: 1. Montreal; 2. Quebec; 3. Other Cities and Towns; 4. Rural communities; and applies distinct regulations to each group. The City of Verdun, incorporated by Act of Legislature, falls under the third division and is also controlled and aided by the "Metropolitan Commission" whose authority covers all sections of the Island of Montreal.

The first duty of a city such as Verdun is to account for the property of the Municipality. A "Valuation Roll" is made up annually including record and assessed value of all immovable property, and is subject to public inspection and protest before being passed by the Council. The "Collection Roll" incorporated in the same form records the taxes as applied against properties, businesses, etc., and the collections thereon. The amounts of collections are based on the Municipal Requirements. Taxes are levied to cover these amounts and may be on: 1. Proprietors' Property; 2. Local Improvements—applying to particular groups of Proprietors; 3. Tenants; 4. Business; 5. Public Improvements.

An Annual Budget is prepared showing the estimated revenue from: (a) Electric Light, (b) Water Taxes, (c) General Taxes on Immovable Property, (d) Snow removal, (e) Licenses, (f) Annual Tax on Rental of Business Premises, (g) Local Improvements, (h) Amusement Taxes, (i) School Taxes, and estimated expenditure over sundry classifications.

Various methods are adopted for the recording of Cash—in the city under discussion one Cash Book is maintained for all Receipts and one for all Expenditures. Receipts follow generally the lines as mentioned above. Expenditures are usually divided into four groups: 1. Capital and the safeguarding of the Municipal credit, including charges for: (a) Bond Interest, (b) Sinking Fund, (c) Contingencies of the Municipality, (d) Provincial Government Charges, (e) Metropolitan Commission Charges; 2. Overhead Charges of Administration; 3. Local Improvements, covering: Sewers, Sidewalks, Water Lanes, Pavings of Lanes, etc.; 4. Housing.

The Collection Roll provides information for making up the List of Accounts Outstanding, from which the older amounts are passed to the Arrears Department for attention.

Monthly reports are prepared and supplied to City Directors covering: Cash handlings for the month with summary of the year to date, supporting which are schedules showing: (a) Details of Collections, and (b) Details of Expenditures, both as compared with the Budget figures.

## MUNICIPAL ACCOUNTING

The city books are closed in accordance with the Auditors' Report, which Report includes among other schedules, information covering the following: 1. Revenue and Expenditures of the Corporation: (a) as a City, (b) as a Water Department servicing Water, (c) as Electric Distributors servicing Light and Power; 2. Bases of Levying Tax; 3. Valuations Taxable—with Tax for full year and for half year; 4. Revenue—actual and estimated; 5. Expenditure—actual and estimated; 6. Works under Construction and Works Authorized; 7. Details of Outstanding Accounts Receivable; 8. Schedule of Assets not considered as ordinary Municipal Assets; 9. Details of Debenture Issues; 10. Detail of Capital Expenditures; 11. Detail of Special Accounts; 12. Statement of Assets and Liabilities.

Mr. Wishart very ably replied to the numerous questions presented to him by those present, who were impressed by the clarity of his presentation and his sympathy with the Accounting Organization.

## COST LITERATURE

### RECEIVED IN NOVEMBER

**C**OST Accounting Applied to Municipal Work. F. R. Chailquist. The Journal of Accountancy, November, 1929.

Notes on Depreciation. "T. H." The Cost Accountant, October, 1929.

Foundry Costing. T. H. Hargrave. The Accountants' Magazine, November, 1929.

A Manual for Budget Preparation. F. Richmond Fletcher, Scovell, Wellington & Co., Boston. The National Association of Cost Accountants, November 1, 1929.

Budgeting as Applied to Automobile Manufacturing. L. A. Baron, Comptroller, Stutz Motor Car Company of America. The National Association of Cost Accountants, November 1, 1929.

Cost Data from the Production Standpoint. Don R. Marsh, Buffalo Forge Company, Buffalo. The National Association of Cost Accountants, November 1, 1929.

Annuity Method of Depreciation. David Himmelblau, C.P.A. The Accountant, November 2, 1929.

Depreciation and Obsolescence as Affected by Appraisals. John R. Wildman, C.P.A. The Accountant, November 2, 1929.

Depreciation and Obsolescence—From the Viewpoint of the Investor in Securities. Sir William Plender, Bt., G.B.E., LL.D., F.C.A. The Accountant, November 9, 1929.

The Manufacturer's Marketing Cost. E. S. Freeman, chief statistician, Dennison Manufacturing Co., Framingham, Mass. National Association of Cost Accountants, November 15.

Successful Methods for Presentation of Cost Data. Gerald A. Torrence, secretary-treasurer, Schulze Baking Company, Kansas City, Mo. National Association of Cost Accountants, November 15.

## CHAPTER NOTES

### MONTREAL

D. R. Patton, C.A., Secretary.

November 7:—

Sixty strong, the Montreal members journeyed to St. Jerome on Thursday, the 7th, on a tour of inspection and edification. The excursion was arranged under the kind direction of Mr. Jean Rolland, president of the Rolland Paper Company, Limited, in co-operation with our genial ex-president, Mr. Lorenzo Belanger.

Setting out from the McGill Union, the party arrived on schedule time at the St. Jerome plant of the Rolland Company. Welcome was extended by the Messrs. Rolland, Lanthier and other officials of the company, and the plant was literally given over to the "cost accountants." Groups under the charge of the company officials were made up and a thorough investigation into the art of paper-making was commenced.

The preliminary stages in the handling of the raw materials—concerned in this plant principally with the sorting, cutting, weighing and bleaching of rags—were shown and explained. These rags, with the necessary chemicals and colors (and perhaps pulp), are mixed in the proper proportion in the "beaters," where they are reduced to a pulp. The paper machines take the wet pulp from the "beaters" and convert it into dry sheets by pressing through numbers of large rollers of ever-rising temperature. The paper, as manufactured here, largely resembles newsprint stock, and forms the basis from which several varieties of the finished product are turned out. The further processes of manufacture comprise chiefly the treatment with certain glue solutions, animal gelatines, etc., and the paper drying processes—whether in the loft or through the more economical air-drying machines. The product, finished as per specifications, is ready for sorting, trimming and packing, and for shipment to the customers, as one of Canada's finest products. But the inherent thoroughness of the "cost accountant" is not yet satisfied. The product must undergo the final rigid test—and this test was applied jointly by the president and ex-president of our society. These two gentlemen were wafted toward the skies supported on nothing else than one sheet of Rolland paper.

The next duty of the delegation consisted of the inspection of another large and successful St. Jerome industry—the Regent Knitting Mills. Guided by Mr. Marcoux, Mr. Paul and several company officials, the party in groups examined the various operations incidental to the finishing of the yarns and their incorporation into the finished knitted goods.

Starting with the stretching and twisting of the yarns on the different forms of racks, the processes were followed through the knitting and weaving departments and through the tailoring of the

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knitted cloth into sweaters and ladies' and children's clothing of striking design. One peculiarly interesting operation was the weaving of work of intricate design and changing colors, with the changes automatically controlled through machine settings.

The evening dinner was a memorable one. After the sumptuous repast had been carefully "accounted for" by the members and all possibilities of "wastage" eliminated, the King's health was well and truly drunk. Brief and well-chosen remarks were made by the presiding officers, Mr. Jean Rolland, our host, and Professor R. R. Thompson, the president of our society. Cost studies, outlining manufacturing processes and accounting in the two industries, were read by Mr. Lanthier of the Rolland Paper Company and Mr. Paul of the Regent Knitting Mills. Through the inspection of the plants greater insight had been given to the members into the processes and problems to be taken into account and the papers proved most interesting and were widely questioned.

The drive home, in a most ideal evening, brought to an end a day of unusual enjoyment and instruction and an occasion successful beyond all expectations. Sincere appreciation is due to our patron, Mr. Jean Rolland, to Mr. Jean Paul Rolland, director and representative of our society in St. Jerome, to Messrs. Lanthier and Paul, for their very excellent papers, to the officials of the two industries who co-operated so heartily with us, and to all who contributed so willingly to make of this venture the success it deserved.

November 21:—

Professor J. A. Coote, B.Sc., of the Faculty of Applied Science, McGill University, introduced at our meeting of November 21st, his series of three lectures which he is presenting to the Montreal Chapter on the study of "Costs and Graphics in Relation to Cost Accounting." Professor Coote has spoken to our Society before; he knows our requirements and in his dealing with charts and kindred methods of graphic illustration, he has stressed their adaption to Cost Accounting work.

Thursday's lecture was used largely in classification and description of the various kinds of charts and their possibilities. Six classifications were used:—

- (1) Charts used to show relation between two or more factors.
- (2) Charts used to deduce laws of relationship.
- (3) Charts used to show divisions of an organic structure and the relation between them.
- (4) Charts used to aid in effective administrative control.
- (5) Charts used as an aid in solving problems.
- (6) Charts used to record facts.

Under group (1) several divisions were mentioned; among the most important were:—

(a) Those used with rectangular co-ordinates—one factor is taken along the horizontal axis and one or more along the vertical. The relationship between different factors might be shown—for instance, if the horizontal co-ordinate represents time, the vertical might be plotted to show the **number** on the payroll and again the **amount** of wages paid, and the variations may be studied through the respective "curves."

(b) Those used with polar co-ordinates—angles of the co-ordinates increase with one factor—usually time—and the curve plotted in

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circular form may continue on the same chart through subsequent periods.

(c) Tri-linear charts—showing in the form of an equilateral triangle on the basis that the sum of the perpendiculars dropped from any point within the triangle is a constant. This is used more usually in showing variation of mixtures.

(d) Bar charts—made up on the principle of group (a), with the exception that in place of joining with a curve, the points as plotted, perpendicular bars are erected on the horizontal co-ordinate. These bars may be sub-divided to show their component parts and their variations.

(e) "Pie" charts—the circle represents the whole and the segments, the size of which is the result of variations of the co-ordinate angles, represent the constituent parts.

(f) Logarithmic scales—divisions on the scale, instead of being equal, vary according to the logarithm of the constant numbers. These charts are particularly useful in showing the variations of one factor in proportion to those of another.

(2) Logarithmic charts are also used largely in group (2) as aid in deducing laws of relationship.

(3) Organization charts had already been taken up in detail by Professor Coote in a previous paper and were touched on lightly here.

Under group (4) the Gantt chart is particularly useful in showing the daily and cumulative quantities of production, working hours, etc., of various departments. It may be adapted to many uses and has found considerable favour in industrial enterprises.

(5) Scales charting multiplication of numbers served as a typical example of those used to solve problems.

Under group (6) was mentioned the recording of boiler pressure through the impression made by a sort of pen-point pushed outward by the varying pressure. The impression may be registered on a circular rotating disc or in a straight line on a chart moved perpendicularly to the pointed instrument.

Professor Coote gave several practical suggestions as guides in chart preparation:—

(a) In allotting the "scale" take into account the degree of accuracy possible from the data supplied. Do not make the drawing as "large as the paper will allow."

(b) Read from bottom to top and from left to right of the chart.

(c) Place figures on the "outside" of the co-ordinates whenever possible.

(d) Co-ordinates should always represent the zero.

(e) Do not cut off the bottom of the chart.

(f) Give a good comprehensive title and show particulars of it in prominence relative to their importance.

(g) For convenience of preparation and study, make the charts of standard size.

The members were highly appreciative of Professor Coote's discussion and will follow the remaining lectures with keen interest.

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### TORONTO

Harold J. McQuillan, Secretary

November 13:—

From Toronto and Hamilton came the challenge "The Tie-in of Factory Records Explains Itself." Some of our men, feeling that one meeting would afford time to merely pry the lid off the subject, demanded two evenings to demonstrate how to tie-up an executive with records and then disentangle him. Our first session on the topic was held Wednesday, November 13th, at the Board of Trade, with R. Oaten, Gurney Foundry Co., Ltd., chairman for the evening. D. C. Patton and G. E. Steel, Sangoma Electric Co.; W. A. McCaffrey, Office Specialty Mfg. Co., Ltd., and G. A. Phare, Rapid-Grip, Ltd., demonstrating a firm grasp of their subject, showed how to remove the kinks from a cost system, and how to introduce new wrinkles for handling waste and salvage.

We may know of some organizations whose sales force and credit man entertain mutual distrust, whose sales manager is often let down through lack of finished product, and whose factory is often at sea with no dependable sales forecast. Our speakers let no hint drop of a similar lack of co-ordination. Their cost men seemed to be as intimate with the factory organization as the foremen themselves. The plant personnel seemed to consider the cost department not as a detective agency, but as a necessity to maintaining the effectiveness of the whole, and its existence in a competitive field.

One example of co-operation was in the design of an export meter. When this meter arrives at its destination it handles electricity similar to Ontario Hydro, but the meter is often handled by a resourceful citizen. He can make an ordinary meter do everything but go in reverse. So the export article is different—what a difference a few cents makes. Some of Mr. Patton's friends asked for a lecture on "Meter Control in the Home." Probably some export meters will be short circuited in transit after the lecture.

Two visitors, representing an old industry undergoing re-organization, stated that their cost department was a major part of the line-up. Their recent appraisal was designed to meet the needs of this department. We expect to hear some details of their operations.

November 27:—

When you want to sell cost accounting, remember that R. Oaten, our vice-president, has visited several distant plants to get data on an improved and simplified cost system. Judging from Mr. Oaten's remarks, he considers his time and effort well spent.

R. Oaten, Gurney Foundry Co., Ltd.; Claude Fox, Stauntons Ltd.; M. J. Roe, Sangoma Electric Co., Ltd.; F. E. Brooks, Canadian National Carbon Co.; C. Warnes and J. A. W. Rowe, Canadian Kodak Co., Ltd., made a success of our second session on "The Tie-in of Factory Records" at the Board of Trade on Wednesday, November 27th.

We saw stoves and radiators travelling along the paths of production toward the public, with the vigilant cost department watching them all. The field of the cost man has widened so that his science indicates what is desirable in trucking equipment and routing of

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materials. Then we saw colourless, almost ugly paper rolling along through life, mingling with common clay, meeting glue and getting stuck up, taking on lustre at last, and becoming a worldly-wise wall-flower. But the cost man knew what would happen; he tabulated the progress of drab paper, noted his losses, sat in judgment on him, and calculated how the public would like him. The progress of film and cameras, electric meters, and products of The Canadian National Carbon Co., were also vividly portrayed. The Bedaux System for the Kodak Co., and excellent cost systems were functioning for the direction of each process. As Mr. Guilfoyle remarked, our friends were certainly steeped in their work, and the brew was strong.

As usual, a group of speakers congregated at the close to plan a future programme. This group will not leave anything to chance. A visitor remarked that on different occasions, cost accountants had been imported to Canada. He agreed, however, that our Society is working toward a condition, wherein the situation may be reversed.

G. G. White of Arlington, N.Y., U.S.A., and W. L. Jardine, Clare Bros. & Co., Ltd., a member from Central Ontario Chapter, were present.

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## CENTRAL ONTARIO

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The November meeting of Central Ontario Chapter, on the 21st, was of unusual interest, being the first plant visit to go in the records of this Chapter. The members turned out in very nearly full strength, as there were about twenty-five present, from as far away as London and Toronto. Arriving at the office of the Guelph Carpet and Worsted Spinning Mills, Ltd., at 4 p.m., we were welcomed by B. F. Griggs, C.A., and G. Earnshaw, secretary-treasurer and cost accountant, respectively, of the company.

The party divided into two groups, one choosing the spinning plant and the other the weaving plant. The former was constructed just a few years ago, and the members saw yarn produced under thoroughly up-to-date methods. In the weaving plant, which is the original section, a little spinning is done, but most of it is given to weaving of carpets and rugs. The operations proved very fascinating, and the hour's time was all too short.

Supper at the Wellington Hotel provided an enjoyable recess. Perhaps the steak was tough, but not too much so for cost men who are supposed to have their teeth on edge.

We returned to the company's office at 7, and the outline of the costing methods given by Mr. Earnshaw drew forth a lively discussion in which practically everyone took part.

The Chapter is much indebted to Mr. H. Quarmby the president, Mr. Griggs, Mr. Earnshaw and other officials of the company for their courtesy in providing this enjoyable evening, and hopes that they will in turn find other meetings equally interesting.

The next meeting is to be held on December 12th, at the office of Babcock-Wilcox and Goldie & McCullough Co., Ltd., Galt, with Stuart H. Sorley, C.A., of Thorne, Mulholland, Howson & McPherson, Toronto, as speaker.

## Depreciation Accounting Methods for Public Utilities

(Report of an address by L. R. NASH, at the International Congress  
of Accountants, New York.)

(Reprinted from *The American Accountant*.)

THE title of the paper presented by L. R. Nash is "Depreciation Accounting Methods for Public Utilities." The author deals only with that part of the broad subject of depreciation which relates to the method of accumulating adequate reserves by which to retire property that ceases to be useful.

Nearly all public utilities are subject to regulation by governmental bodies, usually state commissions, and such regulation implies that the cost of service, including operating expenses and taxes, depreciation requirements, and a fair return upon the value of the property, shall be readily determinable. The utilities in the United States have two major systems of accounting, one developed by the Interstate Commerce Commission for interstate carriers, and a similar system for communication companies under its jurisdiction; and the other a uniform system developed by the commission for local utilities under their jurisdiction. There is a striking difference between the interstate and the state systems with respect to depreciation accounting. The interstate system is based on the general theory that utility property is gradually consumed in service, that the useful life and salvage value of the various property elements are known with reasonable accuracy, and that uniform charges should be made in operating expenses for currently accruing depreciation. This is not done for the property as a whole, but major units and groups of similar units must have separate subsidiary reserve accounts provided for their retirement, and deficiencies in one of these accounts may not be made up from excesses in another. In other words, the charge against any subsidiary reserve in connection with particular retirement is limited to the amount primarily accrued therein with respect to the units of property involved. This so-called straight-line system of depreciation charges is intended to create and maintain a reserve consistently equal to the accrued depreciation of the property.

The state system of accounting involves a quite different theory and provides a reserve for retirements rather than depreciation. This system exists upon the assumption that it is neither practicable nor necessary to determine the useful life of property elements. It provides for a reserve, not to offset loss in usefulness or value, but rather for the purpose of equalizing retirement costs. The basic difference between interstate and state systems relates to useful life, the first assuming that this can be determined with reasonable accuracy and that appropriations should be uniform, the second assuming that useful life is uncertain and that flexibility in appropriations is not only reasonable and proper for that reason, but also for stability of income and maintenance of credit.

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The author points out that changes and developments in the major fields of utilities have been so rapid and radical that he can not subscribe to any theory implying a definite or even approximate knowledge of future usefulness of existing utility property. There are two main causes of retirements, physical and functional. The former includes wear, decay, corrosion, and other similar causes. The latter may be divided into groups which might be designated as absolescence, inadequacy, supercession. The preponderance of retirement is due to the functional causes.

The two accounting systems are alike to the extent that they seek to stabilize certain costs for a period of years. The costs in question are, however, quite different, one including only depreciation, the other emphasizing the overall cost of service, in which retirement charges are an important stabilizing factor. The reserves which both systems provide are usually quite different in size, but even if they were the same, the methods of accumulation are unlike, being uniform and flexible respectively. This is the essential difference.

The interstate system is objected to on the grounds that its cost is burdensome, and that it permits inaccuracies because it is based on an assumption as to useful life which the outstanding executive and technical talent in the industry believes to be untenable. The author points out that there is little room for improvement of this system.

The state system, on the other hand, while not perfect can be improved, particularly in regard to limiting its flexibility, which without wise supervision may be carried to unsafe extremes. This state retirement system has been in effect increasingly only since 1922. It should be noted, however, that this system is new only with respect to its standardization and official endorsement. It is in substance, the system most commonly used since the origin of depreciation accounting. Where it has been consistently used it has promoted stability of business and credit, expansion of facilities, and community development. It may, therefore, claim for itself demonstrated success based upon long practical experience with its essentials.

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## NEW MEMBERS

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The following are new members of the Society:

### Montreal

Clarke, A. G., C.P.A., 1020 Transportation Bldg., Montreal.  
Tighe, E., C.A., DeLoitte, Plender, Haskins & Sells, Montreal.  
Holder, O. J., Canadian Comstock Co., Ltd., Montreal.

### Toronto

MacPhee, E. D., York Knitting Mills, Ltd., Toronto.  
\*Presgrave, R., York Knitting Mills, Ltd., Toronto.  
\*Higgs, S. S., York Knitting Mills, Ltd., Toronto.  
\*Rutter, G. W., York Knitting Mills, Ltd., Toronto.  
Matthews, F. K., Canadian Bank of Commerce, Toronto.  
Wagner, D. P., Canadian Bank of Commerce, Toronto.

## NEW MEMBERS

- \*Watson, J. E., Durant Motors of Canada, Ltd., Leaside.  
 \*Ferguson, J. T., Canadian Kodak Co., Ltd., Toronto.  
 Irwin, J. H., Dominion Wheel & Foundries, Ltd., Toronto.  
 \*Williams, S. A., Dominion Wheel & Foundries, Ltd., Toronto.  
 Mellanby, H. T. J., The Robert Simpson Co., Ltd., Toronto.  
 \*Reid, F. E., The Robert Simpson Co., Ltd., Toronto.

### Winnipeg

Milne, S. M., Rankin, Saul & Thornton, Winnipeg.

### Central Ontario

- Voelker, E. W., Baetz Bros. Specialty Co., Ltd., Kitchener.  
 \*Bieman, R., Baetz Bros. Specialty Co., Ltd., Kitchener.  
 \*Schmidt, N. E. W., Baetz Bros. Furniture Co., Ltd., Kitchener.  
 \*Dennis, G. S., Baetz Bros. Furniture Co., Ltd., Kitchener.  
 Slumkoski, A. C., John Walter & Sons, Ltd., Kitchener.

\*Junior membership.

## THE TREND OF PRODUCTION COSTS

COMMODITY prices, wholesale, declined slightly in October, but were still a little ahead of the last year. The following compares the index numbers of the Dominion Bureau of Statistics, based on 502 commodities, with 1926 prices taken as 100:

	Oct. 1928	Sept. 1929	Oct. 1929
Consumers' goods .....	95.7	95.6	95.4
Producers' goods .....	93.7	99.0	97.3
Producers' equipment .....	92.8	94.8	94.4
Producers' materials .....	93.8	99.5	97.6
Buildings and construction materials .....	98.0	100.2	98.8
Manufacturers' materials .....	92.9	99.3	97.3
All commodities .....	95.2	97.3	96.7

While the changes in all commodities and in consumers' goods are small, the declines in producers' materials, including both those for manufacturing and those for building, are considerable.

The most important price reductions in October were in the following: Fresh and dried fruits, live stock, meats and poultry, hides and skins, raw cotton, flax hemp and jute products, raw silk, raw wool, lumber, silver, tin, zinc, pottery, petroleum products, and sand and gravel.

Important advances took place in the following: Fishery products, milk and its products, fats, eggs, and wood pulp.

The easing of money conditions has lowered interest rates and loans can be readily obtained for sound business development.

There were eleven strikes and lockouts in Canada in October, compared with nine in the preceding month. Four were carried over from September into October, and seven others commenced in October, while five were terminated, and the following six remained at the end of October: compositors, Nelson, B.C.; moulders, Montreal; pulpwood cutters and camp workers, Thunder Bay district; coppersmiths, Toronto; silversmiths, Toronto; and stagehands, Ottawa.

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